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BATHYCALANUS SVERDRUPI, N. SP., A COPEPOD
CRUSTACEAN FROM GREAT DEPTHS IN
THE PACIFIC OCEAN¹

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Several species of unusually large, free-living copepods have been described from net hauls extending to great depths in the ocean. Among these large calanoids are the following hitherto described, closely related genera and species: *Bathycalanus richardi* Sars (1905); *Bathycalanus bradyi* (Wolfenden) (1905); *Bathycalanus princeps* (Brady) (1883); *Megacalanus princeps* Wolfenden (1904); *Megacalanus sarsi* Farran (1939); *Bradycalanus typicus* Scott (1909); *Bradycalanus gigas* Sewell (1947).

Much confusion has existed relative to the taxonomy of the group. The above grouping is based on a special analysis made by Farran (1939) in an effort to clear up the synonymy. More recently Sewell (1947) gave the group further study and in addition to describing a new species, *Bradycalanus gigas*, removed the group from the family Calanidae and created a new family, Megacalanidae, to receive it. These studies appear to have put the group on a fairly stable basis systematically though a larger series of collections is needed to establish what, if any, variations may occur.

The present study, which is being supported in part by the National

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Science Foundation (no. NSF-G4993), adds a new species to *Bathycalanus*. This species is especially remarkable because of its huge size, being the largest of all free-living copepods hitherto described. Two adult females (fig. A) were found in an open trawl collection made by the Scripps Institution of Oceanography vessel *Horizon* at a towing depth of 2103 meters at 12° 33' N., 164° 49' E., July, 1956.

***Bathycalanus sverdrupi* Johnson, new species.**

The chief generic characters which serve to distinguish this species from those of closely related genera are: (1) the second maxillae, which are armed with long, ribbon-like setae that bear exceedingly fine processes and sharply curved distal ends; (2) the absence of any setae on the second inner lobe of the first maxillae; (3) the cutaneous pores of the "maculae

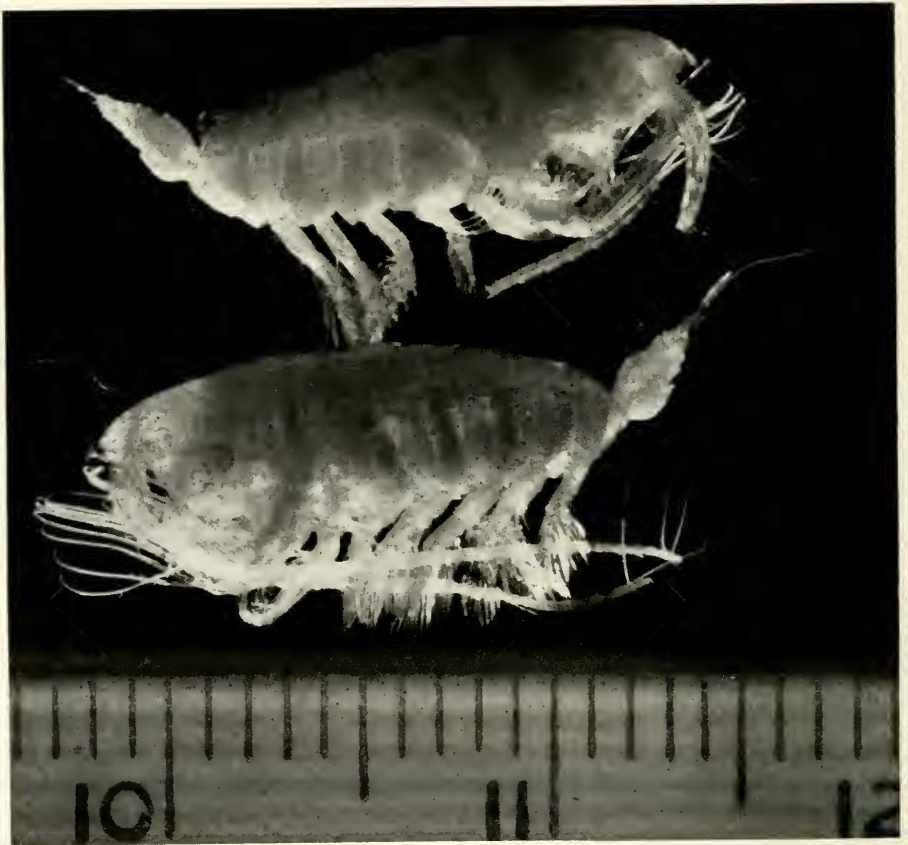
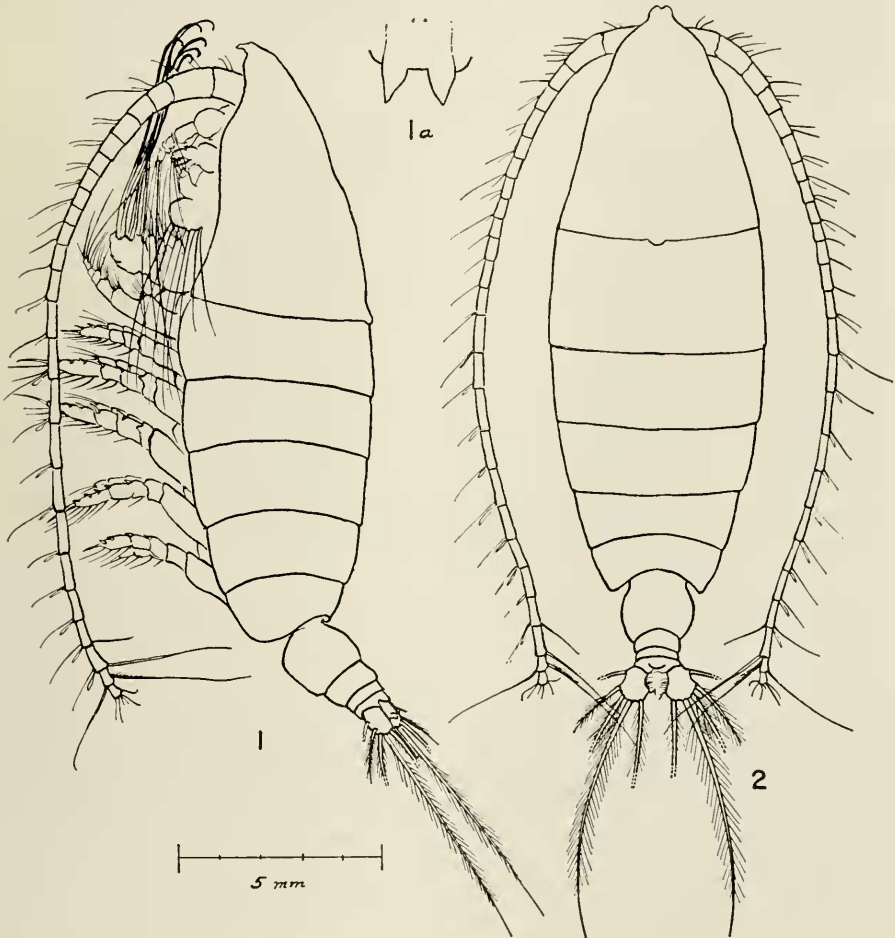


Figure A. *Bathycalanus sverdrupi*, new species. Photograph of females, top specimen has fifth feet removed. Scale in mm.

eribrosae" being arranged in clumps, not in an oval or ring; (4) only the terminal segment of the exopod of the first pair of feet is provided with external marginal spines. In the other genera the exopod bears a marginal spine on each of the three segments of the first feet.

SPECIFIC CHARACTERS. FEMALE.

Body. The body is robust and tapers rather sharply in both lateral and dorsal aspects (figs. 1 and 2). The urosome (posterior body division) is relatively short in relation to the anterior division, the ratio being about



Bathycalanus sverdrupi, new species.

Figure 1. Female, lateral.

Figure 1a. Female, rostrum, anterior aspect enlarged scale.

Figure 2. Female, dorsal.

1 to 4.5 as contrasted with about 1 to 3.2 in *Bathycalanus richardi* and *Bathycalanus bradyi* and 1 to 3.7 in *Bathycalanus princeps*. The genital segment is large and tumid and there are three short abdominal segments between it and the short caudal rami. The rostrum (fig. 1a) consists of two stout tapering prongs unlike the sausage-like processes described for other known species of *Bathycalanus*. The head bears no crest as in *Bathycalanus princeps* and no horn-like process or sensory hairs were observed; however, two small pit-like spots occur just above the rostral prongs. The posterior margin of the 5th thoracic segment is rounded. The body contains much oil and the color of freshly caught specimens is deep red. The unusually large size, 16.8 and 17 mm. in length, is probably also specific. The previous maximum size record is 14.9 mm. for *Bradycalanus gigas* Sewell.

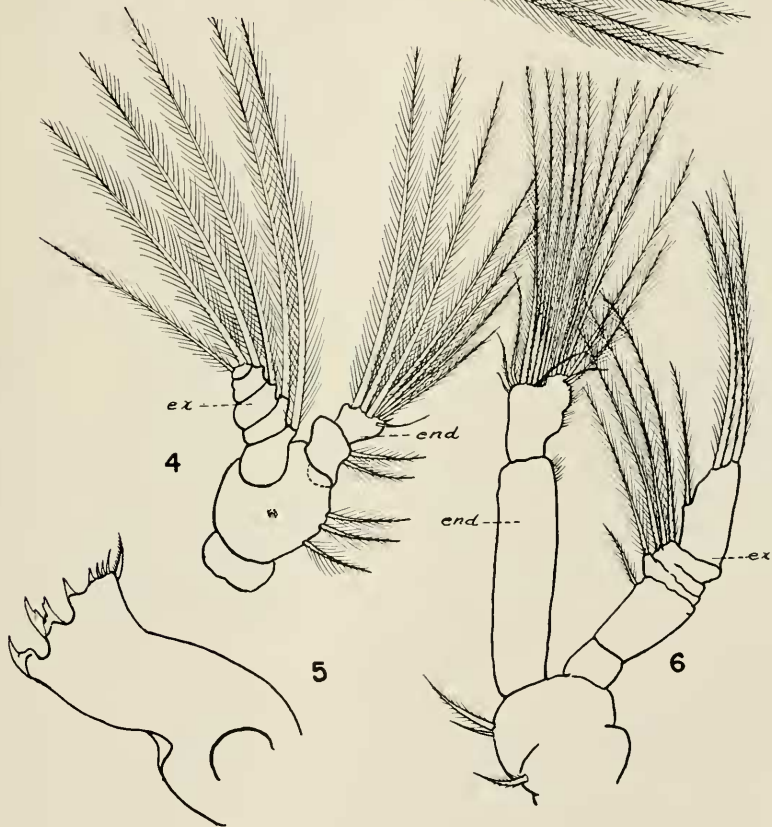
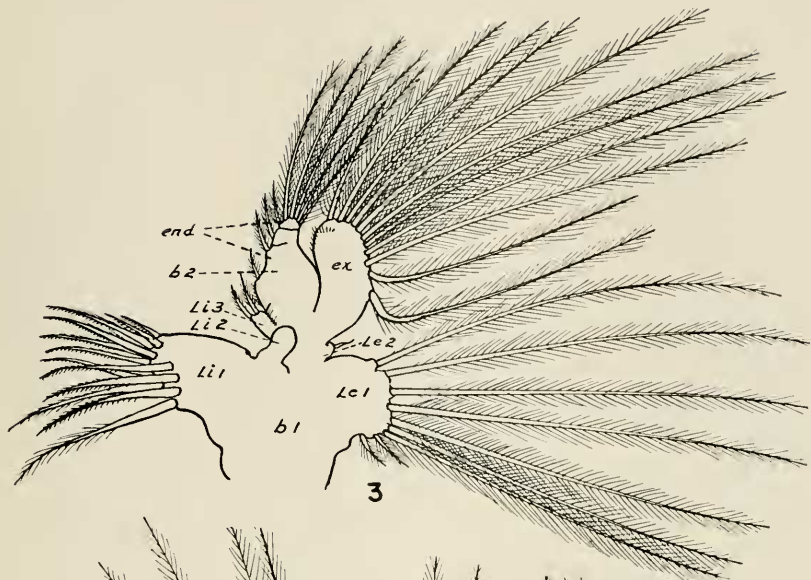
FIRST ANTENNAE. The first antennae consist of 25 segments and hardly reach the end of the caudal rami. (These appendages were intact in only one specimen). This is in striking contrast to the long first antennae of other known *Bathycalanus* species. They overreach the caudal rami by 5 to 6 segments in *Bathycalanus bradyi* (Sewell, 1947), by $\frac{1}{4}$ of their length in *Bathycalanus princeps* (Rose, 1933), and by nearly $\frac{1}{3}$ their length in *Bathycalanus richardi* (Sars, 1925). The terminal segment is very short.

SECOND ANTENNAE (fig. 6). These appendages are similar to those figured by Sars (1924) for *Bathycalanus richardi*, but lack the setae on the distal part of the first endopod segment and possess a lateral seta on the seventh (terminal) exopod segment. The second antennae appear not to have been critically studied in the other species.

MANDIBLE (figs. 4 and 5). The second endopod segment bears only two setae and a group of cutaneous pores occurs on the second basal segment. The mandibular blade is well developed and bears teeth as shown in figure 5.

FIRST MAXILLAE (fig. 3). These are characteristic of the genus but have only one seta each on the second basal segment and on the first and second segments of the endopod. This differs from the arrangement on other species. Sewell (1947) has called attention to the use of setae arrangement on the first maxillae as diagnostic characters for the genera and species.

SECOND MAXILLAE (fig. 8). These appendages are strongly developed and conspicuous in the species. The long heavy setae are characteristic of the genus, being armed on the distal $\frac{2}{3}$ with very fine, closely set processes which curve into ringlets that appear to form a continuous tube. The ends of the setae are strongly curved. A distinctive feature of this



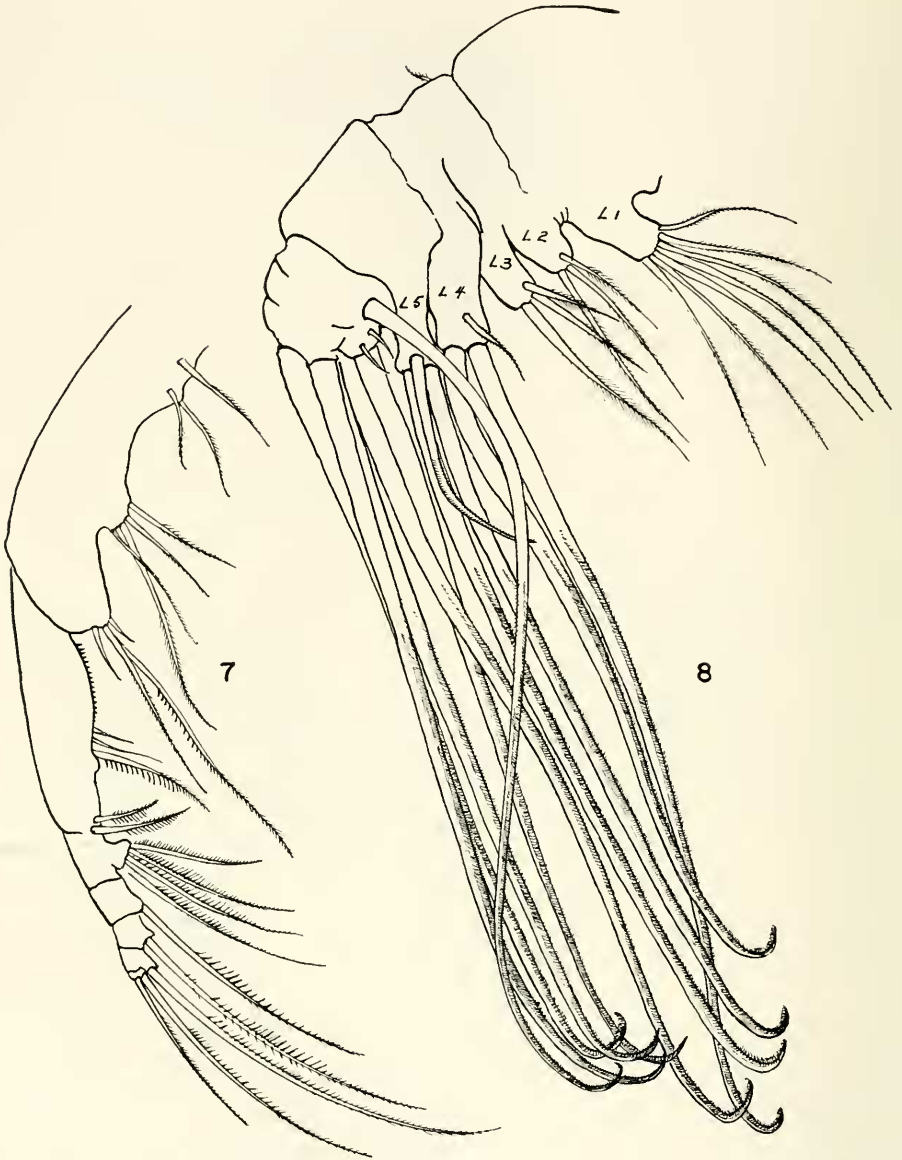
Bathycalanus sverdrupi, new species, female.

Figure 3. First maxilla. b 1, 1st basis; b 2, 2nd basis; end, endopod; ex, exopod; Le 1-5, external lobes; Li 1-3, internal lobes.

Figure 4. Mandibular palp.

Figure 5. Mandibular blade.

Figure 6. Second antenna. end, endopod; ex, exopod.



Bathycalanus sverdrupi, new species, female.

Figure 7. Maxilliped.

Figure 8. Second maxilla. L1-L5, lobes of the bases.

Bathycalanus sverdrupi, new species, female.

Figure 9. First leg, anterior surface.

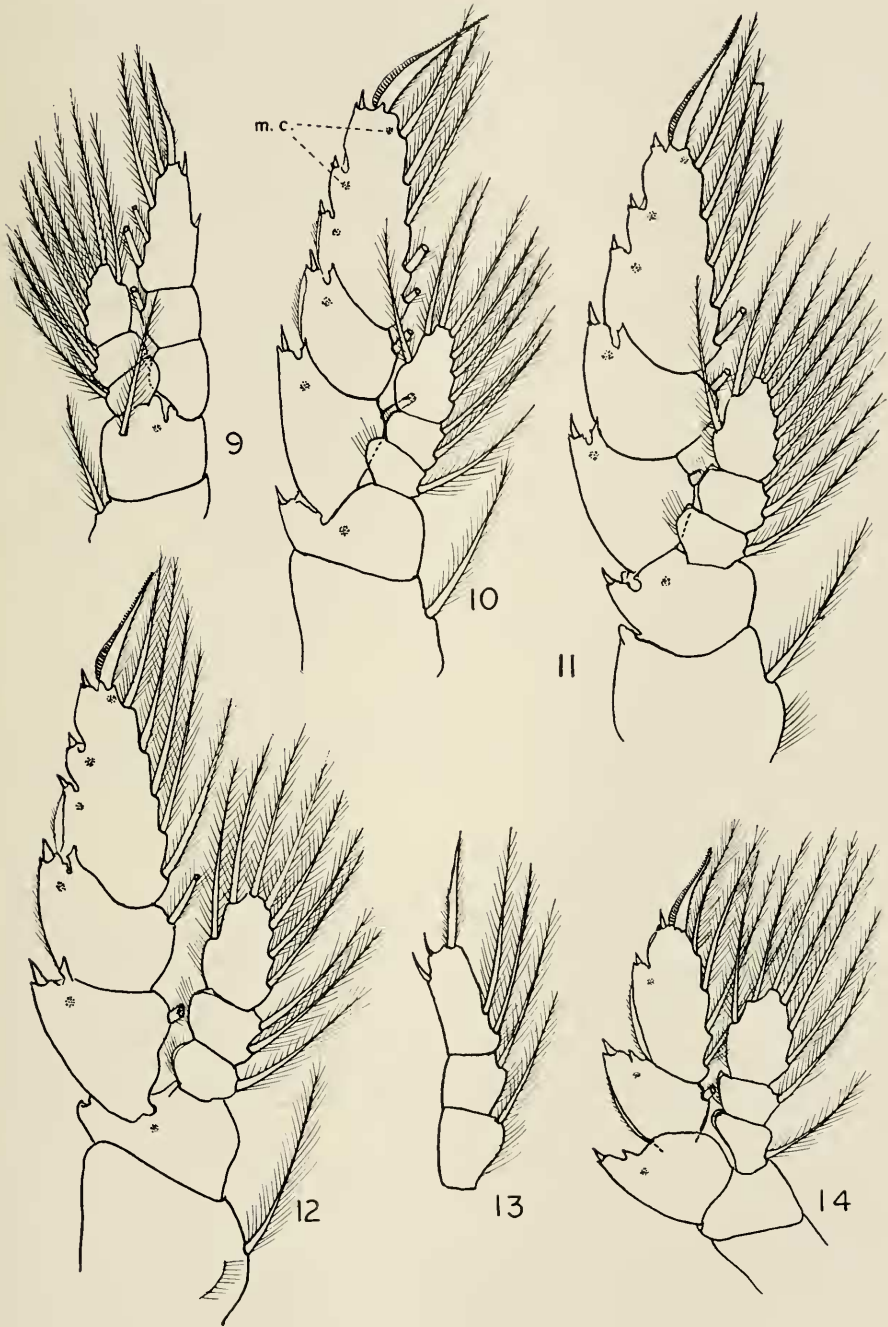
Figure 10. Second leg. m.c., maculae cribrosae.

Figure 11. Third leg.

Figure 12. Fourth leg.

Figure 13. Exopod of first leg—abnormal.

Figure 14. Fifth leg.



species appears to be the much stronger development of the setae on the fourth lobe of the second maxillae. These setae are similar to those of lobe 5 and of the endopod.

MAXILLIPEDS (fig. 7). There appears to be but little distinction between these and the corresponding appendages of *Bathycalanus princeps*. There is but one strong seta on each of the endopod segments 2, 3, and 4. The other two species are provided with additional small setae on these segments.

SWIMMING FEET (figs. 9-14). The first pair of feet have three-segmented exopods as in *Bathycalanus princeps* and *Bathycalanus bradyi*. The remaining feet agree closely with those of all of the known species in having three-segmented rami and in having three external spines on the terminal segment except in the fifth pair of feet which bear only two external spines. There is no retroverted spine on the second basis of the first legs. The terminal segment of the exopod of the first feet has two smooth spines and four inner setae as shown in figure 9; however, in one female the opposite foot was abnormal as in figure 13. This same female had three setae on the second endopod segment of one of the feet of the second pair instead of the normal two setae. "Maculae cribosae" occur in all of the feet.

HOLOTYPE in U. S. National Museum, No. 101078.

PARATYPE in California Academy of Sciences, No. 34987.

The species is named for the late Dr. Harald U. Sverdrup, renowned oceanographer.

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